

Build your own custom assistive technology interfaces with a MaKey MaKey!

1) Learn the basics about the MaKey MaKey

- a. Refer to the MaKey MaKey website and videos to learn about it.
- b. Won't be covered in this example template, but will be covered in-depth for the educators.
- c. The group will need to understand the basics of connecting things to ground, as well as how to create contacts using found objects. They will be guided through the process of connecting found objects and making them reliably trigger events.

2) Identify the needs of the user.

- a. Sit down with the student and get to know them.
- b. Ask them what frustrates them about using a computer right now.
- c. Ask them to tell you what they **can** do and what they **wish** they could do.
- d. It's important to make sure that the student feels that they are an important part of the process. After all, your goal is to make an interface **for them**, so they will ultimately have the final say in what you make.
- e. Remember that your role is not to create a general assistive device that meets all of the student's needs. Instead, you are trying to find a way to help the student **make art** using technology. Take the time to listen to what the student is most excited about, but keep in mind that you are looking for **simple** solutions to specific problems.

3) Identify the capabilities of the user

- a. Use the attached **Body Mobility Chart** to identify mobility capabilities and restrictions.
 - i. Use the bubbles next to each body part name to indicate the difficulty of the movement. It can be difficult due to pain, or simply due to restriction from other assistive tech.
 - ii. Jot a quick note about the movement to indicate whether it is fully movable, or whether it is easier to move in one direction or not the other. For example, if the person can lean left and right easily at their hips, but twisting or bending forward is difficult.
- b. Work with the student at a normal computer for a short period of time and learn what kinds of actions they can do, which actions are challenging, and which actions are impossible.
 - i. Can they move the mouse, but not click easily?
 - ii. Can they hit certain keys on the keyboard easily, but others not as well?

- iii. Are there actions that they need to perform often, but become fatigued over time (Space, Enter, left mouse click, etc.)?

4) Learn how to use the MaKey MaKey for useful actions

You can use the MaKey MaKey to trigger simple or complex actions, though I recommend first finding ways of using simple actions.

Simple actions:

You can use simple actions like arrow keys or mouse movement to draw on the screen in some programs. Keys like W, A, S and D are also commonly used in video games for movement. So yes, you absolutely have permission to go play a bunch of simple games to see which ones use only a few keys!

Try using a simple drawing program like Paint or even Photoshop to see if you can paint on the screen using only simple mouse movement and the left click button.

1. Available on front: arrow keys (up/down/left/right), Space and left mouse click
2. Available on back: W, A, S, D, F, G, mouse movement (up/down/left/right), right click and left click

Complex actions:

Depending on your skill level, interest and motivation, you may want to try to make *scripts* that run whenever a key is pressed with the MaKey MaKey. This is definitely more advanced than using the MaKey MaKey directly, but you may be able to do some very cool things with scripts!

On Windows, try out:

- AutoHotKey (<http://www.autohotkey.com/>)

On Mac, try out:

- Automator (built-in)

You can also try building your own scripts in simple programs like Scratch from MIT (<http://scratch.mit.edu>)!

5) Sketch out a few ideas for interfaces

- a. Compile a list of actions that the student **wishes** they can do, from the notes you took in Step 2.
- b. Make a list of all the physical motions the student can perform with relative ease, using the chart from Step 3.
- c. Read through the examples in the *Example interfaces (low quality)* document to gain some inspiration, keeping an eye out for ideas that would work for your student.
 - i. At first it will probably seem pretty daunting to make up an interface from scratch, so don't pressure yourself to make a great interface out of the blue. Brainstorm, sketch, give yourself time for your subconscious to process the information you've taken in and put things together. It is better to generate a pile of good and bad ideas than it is to try to make a perfect idea the first time.

6) Acquire the materials necessary for your interface

- a. A MaKey MaKey will be provided for you, and maybe some fun conductive material.
- b. Don't forget to bring some tools with you, like scissors and tape – you will need them!
- c. If your interface has parts that can be assembled ahead of time, you should try to do so. That way you can spend as much time as possible tweaking the interface and getting feedback from your student.

7) Assemble the interface

- a. Build your interface **one piece at a time**. This may need to be done with the student present, but if you can assemble just the pieces by yourself for testing, go for it.
- b. Test out each piece to make sure it's working before moving on to the next.
- c. Try using a simple Flash game on a website like <http://miniclip.com> or <http://kongregate.com> just to make sure that input working from the MaKey MaKey.
- d. Take clear photos of what you are doing so you can share with others.
- e. Take some notes about what you found to work well, and what didn't work as well as you were hoping.

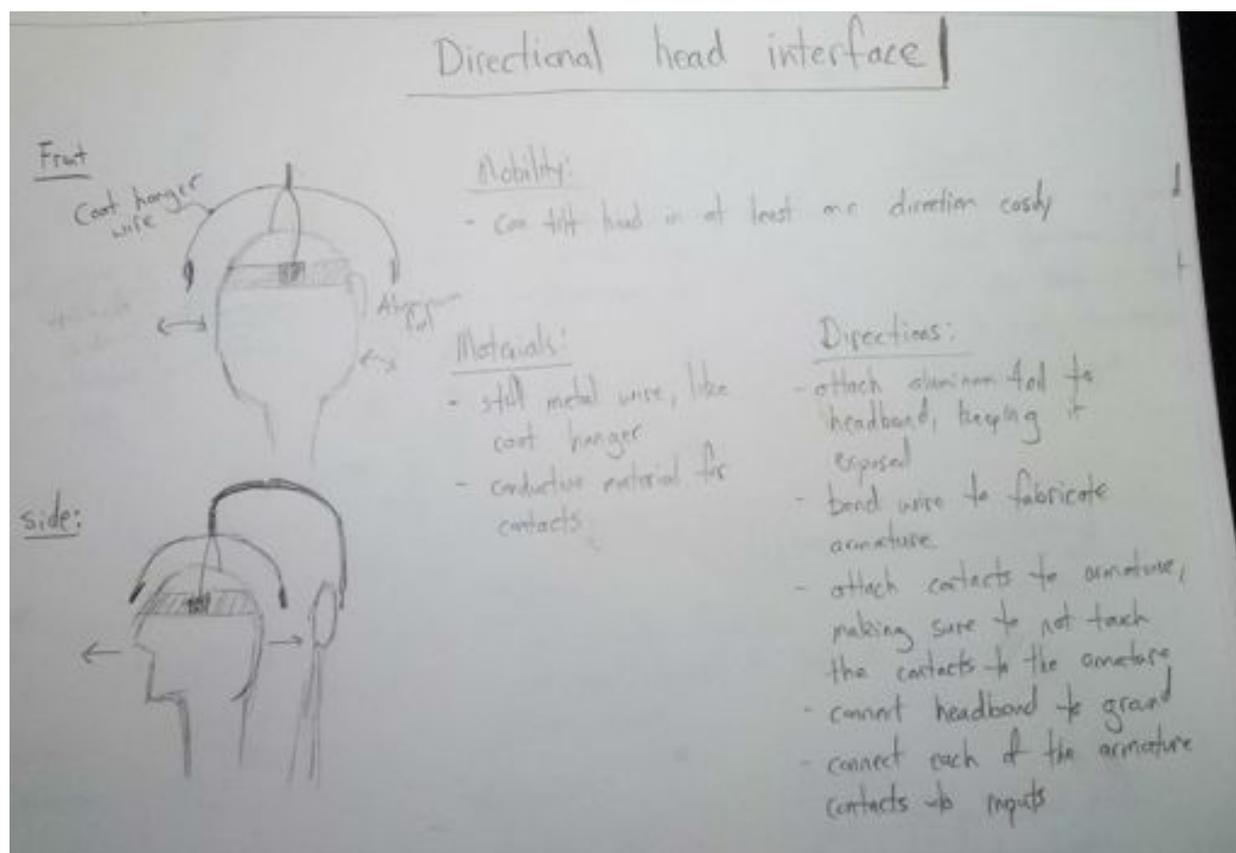
8) Try out the interface with the student and tweak

- a. If you haven't been doing so already, bring the interface to the student and actually install it with them.
- b. You should expect to spend a fair amount of time adjusting minute details, like placement of the various contacts, padding for comfort.
- c. Paying attention to whether the student is getting fatigued by the interface in any way.
- d. Document your results and the reactions of your student.

Directional head movement interface

If the student can tilt their head in different directions, you can build an interface that lets them tap different contacts with their head to trigger keyboard or mouse movements.

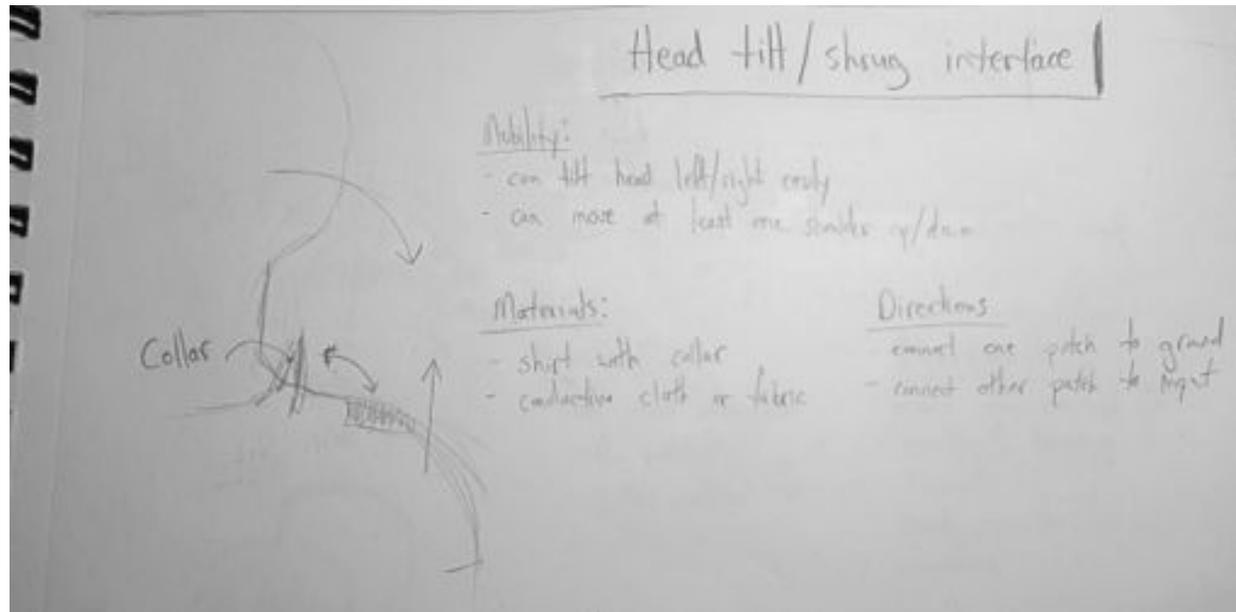
Notes: Built a headband out of aluminum foil, then construct an armature that holds small strips of aluminum foil around the student's head. Connect the headband to ground, then each of the hanging contacts to different inputs on the MaKey MaKey. Be sure to keep the armature electrically isolated from the attached contacts!



Head tilt/shrug interface

If the student is to both tilt their head left/right and move their shoulder's up/down, they can make use of a "shrug" interface.

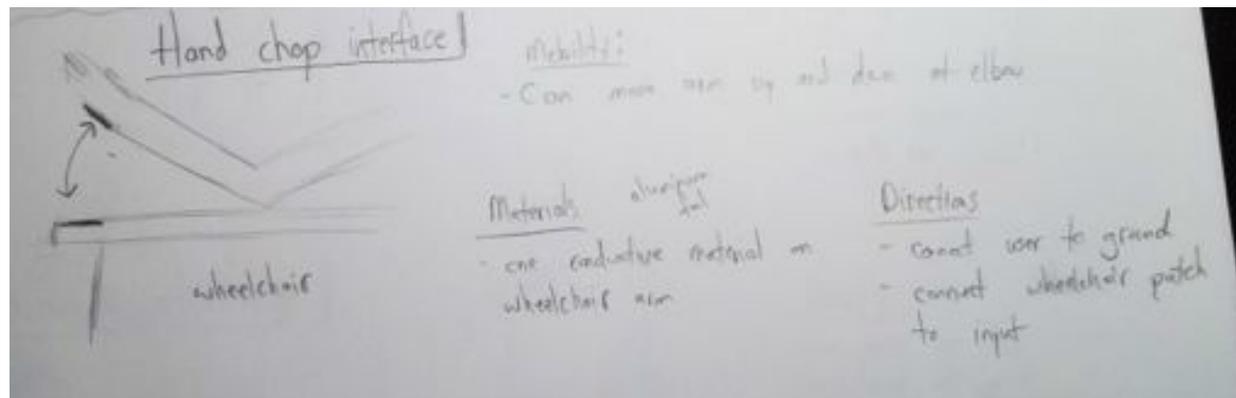
Notes: Attach a piece of aluminum foil to the collar of a shirt, preferably a shirt with a tall, stiff collar like a turtleneck. Now attach a piece of aluminum foil on the student's shoulder such that when they shrug and tilt their head, the two pieces of aluminum foil touch. Now connect one of the aluminum foil pieces to ground and the other to a MaKey MaKey input, like the left mouse click.



Hand chop interface

If the student is able to raise and lower their forearm / hand, they can use their entire hand as a button.

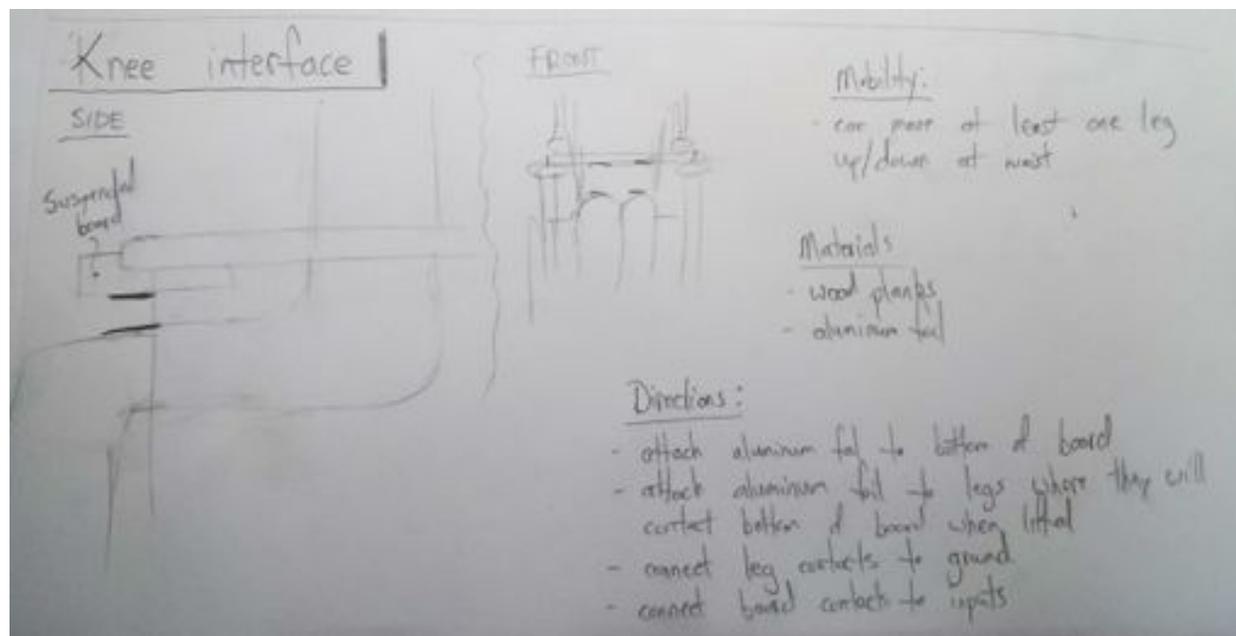
Notes: Either attach a piece of aluminum foil (connected to ground) to the user's hand, or simply connect the user to ground directly. Attach a piece of aluminum foil to the user's wheelchair armrest, or a nearby desk. Connect this piece of foil to one of the MaKey MaKey's inputs.



Directional head movement interface

If the student can tilt their head in different directions, you can build an interface that lets them tap different contacts with their head to trigger keyboard or mouse movements.

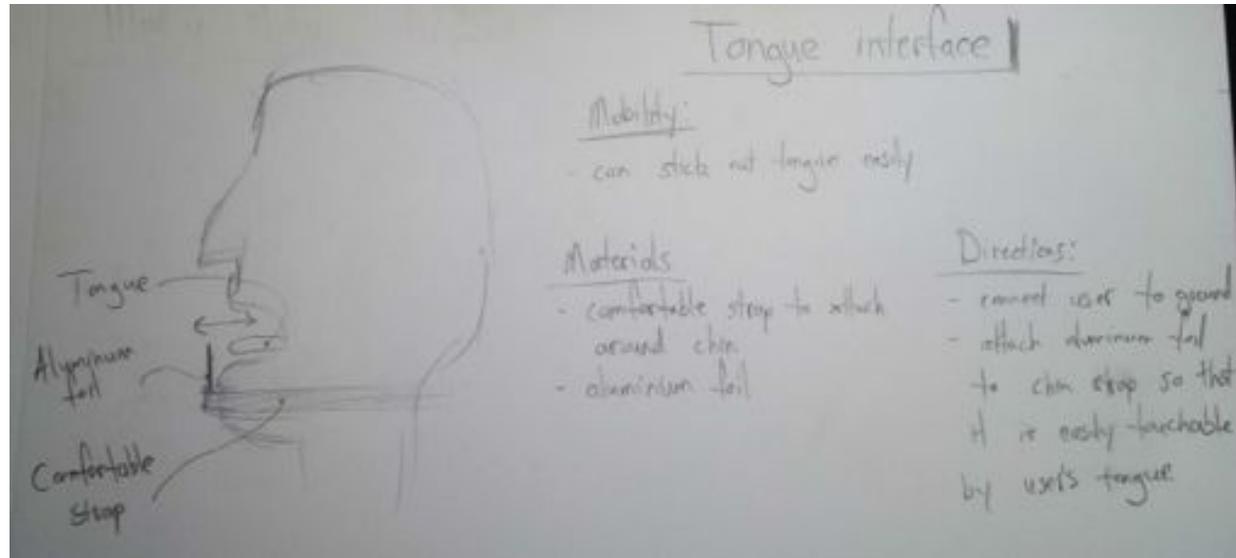
Notes: Built a headband out of aluminum foil, then construct an armature that holds small strips of aluminum foil around the student's head. Connect the headband to ground, then each of the hanging contacts to different inputs on the MaKey MaKey. Be sure to keep the armature electrically isolated from the attached contacts!



Tongue interface

This goofy interface may be useful for more fun tasks, rather than very serious functional tasks. If they are able to stick out their tongue, then have them lick a piece of aluminum foil to trigger something.

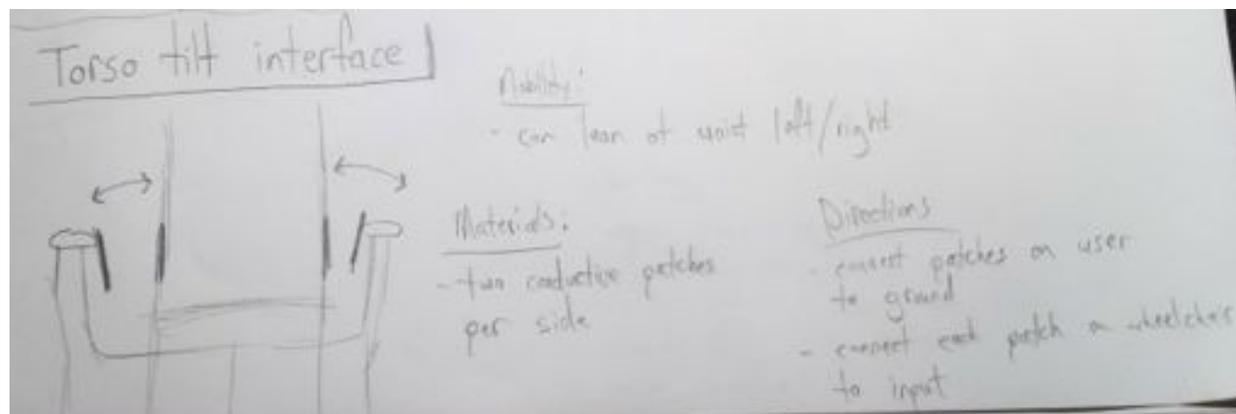
Notes: First find a way to make a **comfortable** strap that goes around the user's chin. Slip a piece of aluminum foil between the strap and the user's chin, then connect this piece of foil to a MaKey MaKey input. You can glue or tape the foil onto a small chunk of cardboard to give it some more strength.



Torso tilt interface

If the student is able to easily lean their body left and right, then you can use aluminum foil and cushions to create a “leaning” interface.

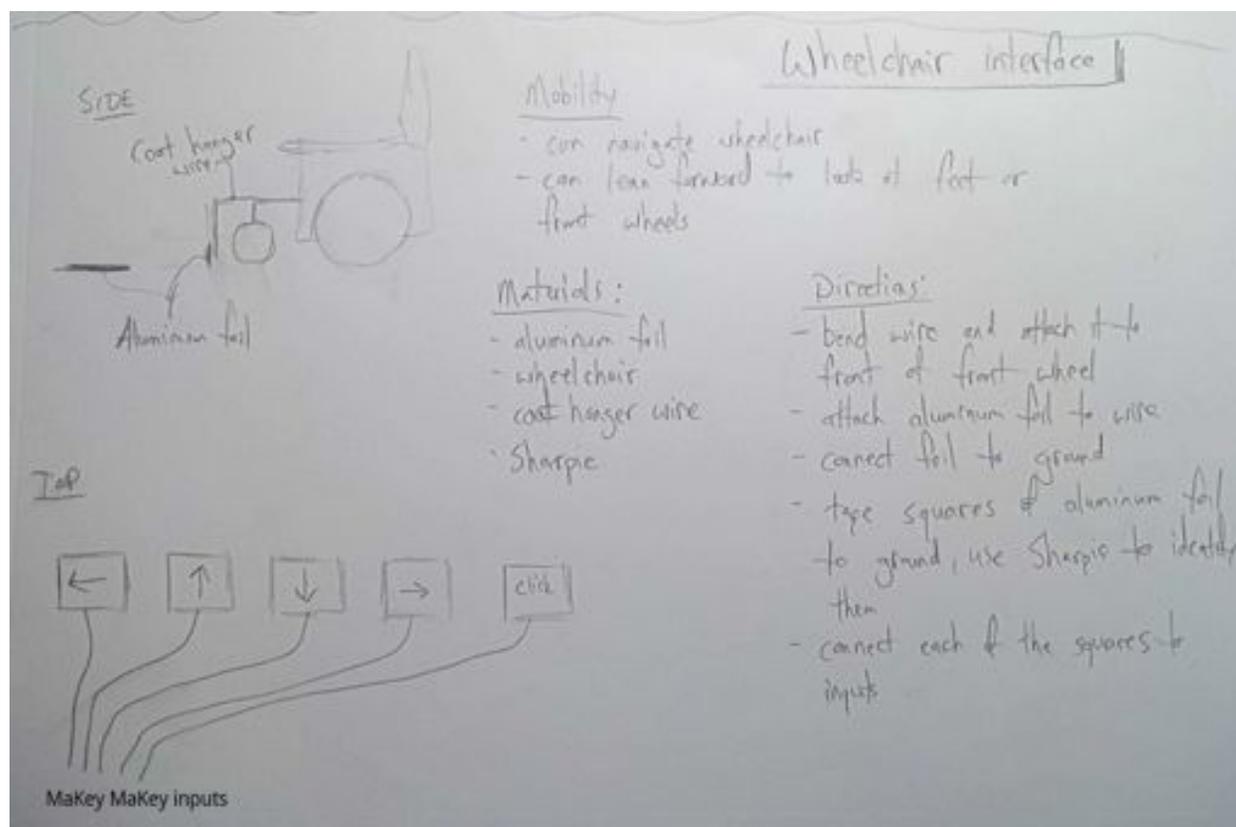
Notes: Attach aluminum foil contacts to the user’s sides, and connect these to ground. Attach a piece of aluminum foil to a cushion or pillow that can fit between the user and their chair – make sure the user is not in contact with the cushion by default! Attach these contacts to inputs on the MaKey MaKey.



Wheelchair interface

Interfaces need not be tied directly to the student's body. You can use the student's wheels as an input device!

Notes: Get a coat hanger and bend it such that you can hang a piece of aluminum foil out in front of the user's wheelchair. Connect this hanging piece of aluminum foil to ground. Place large squares of aluminum foil to the floor (maybe tape them in place and strengthen them with a cardboard back). Use a Sharpie to mark the function of each square, then connect each square to the MaKey MaKey as inputs. Now, as the user moves their wheelchair over each of the squares, they can control the arrow keys, mouse or other keys!



Body mobility chart

Student name: _____

○○○○○ Tongue

○○○○○ Jaw

Head/neck ○○○○○

○○○○○ Right shoulder

Left shoulder ○○○○○

○○○○○ Right elbow

Left elbow ○○○○○

○○○○○
Right wrist/hand

○○○○○
Left wrist/hand

Hip / torso ○○○○○

○○○○○ Right leg (upper)

Left leg (upper) ○○○○○

○○○○○ Right knee

Left knee ○○○○○

○○○○○ Right ankle/foot

Left ankle/foot ○○○○○

